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A study on Optimized Link State Routing Protocol (OLSR),Address Resolution Protocol (ARP) and Dynamic Host Configuration Protocol (DHCP)

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Abstract:

A Mobile Ad-hoc network is a set of mobile terminals moving in different directions at different speed being wirelessly connected to each-other. In this paper we study the proactive Link State Routing Protocol – OLSR, which uses hello and topology control (TC) messages to find then distribute link state data throughout the mobile ad hoc network. Individual nodes use this topology data to calculate next hop destinations for all nodes within the network using shortest hop forwarding paths. We then suggest ways by which the existing algorithm can be optimized in terms of delay, throughput, power consumption, jitter etc. Finally we summarize the applications of OLSR.

I. Introduction

A collection of wireless mobile hosts that are ready to dynamically establish a short lived network with none support from fixed infrastructure is Mobile Ad-hoc Network (MANET). The mobile hosts are connected via wireless links and acts as a router for each other. MANETs finds the simplest way in fields wherever communication infrastructure is pricey and/or time overwhelming. The properties of MANETs that's mobility and absence of infrastructure makes to applicable to operations with time constraints and rescue operations. several analyzers performed research within the space of wireless multi-hop networks by pc simulations and experiments. Most of them aren't targeted on up mobility however throughput was taken care of .A concept of dynamic probabilistic broadcasting scheme for mobile ad-hoc networks was proposed where nodes move according to different mobility models. this idea or approach out performs the FP-AODV (Fixed probability Ad-hoc on-demand Distance Vector) and simple AODV in terms of saved rebroadcast underneath completely different mobility models. It in addition achieves higher saved rebroadcast and low collision in addition as a low range of relays than the fixed probabilistic scheme and straightforward AODV. Being a proactive protocol, routes to all or any destinations inside the network are noted and maintained before use. Having the routes obtainable inside the standard routing table will be helpful for a few systems and network applications as there's no route discovery delay related to finding a brand new route. The routing overhead generated, while usually larger than that of a reactive protocol, doesn't increase with the amount of routes being created. The approach also can be optimized on terms of period provided for the nodes by the protocol and by reducing the topology control overhead. Another approach known as OLSR-L which mixes the routing protocol and location protocol that will increase the strength of the network.

II. Routing Protocol

The OLSR protocol may be a proactive routing protocol, that builds up a route for information transmission by maintaining a routing table within each node of the network. The routing table is computed upon the information of topology info, that is changed by suggests that of Topology control (TC) packets. The TC packets successively square measure designed when each node has crammed its neighbor list. This list contains the identity of neighbor nodes. A node is taken into account as a neighbor if and provided that it are often reached via a bi-directional link. OLSR makes use of hello messages to seek out its one-hop neighbors and its two-hop neighbors through their responses. The sender will then choose its Multi point Relays (MPR) supported the one-hop nodes which supply the most effective routes to the two-hop nodes. during this approach, the quantity of management traffic are often reduced. every node has conjointly AN MPR selector set that enumerates nodes that have chosen it as an MPR node. OLSR uses TC messages beside MPR forwarding to disperse neighbor info throughout the network. Packet loss is usually computed at higher layers than routing one. However, AN estimate of the packet loss is required by OLSR so as to assign a weight or a state to each link. Host Network Address (HNA) messages square measure employed by OLSR to disperse network route advertisements within the same approach that TC messages advertise host routes. each node computes the trail toward a destination by suggests that of a simple shortest-path algorithmic program, with hop-count as target metric. during this approach, a shortest path may end up to be conjointly not smart, from the purpose of read of the packet error rate. consequently, recently olsrd has been

equipped with the LQ extension, that may be a shortest-path algorithmic program with the typical of the packet error rate as metric. This metric is usually referred to as because the ETX, that is outlined as $ETX(i) = 1/(NI(i) \times LQI(i))$.

Given a sampling window W , NI(i) is the packet arrival rate seen by a node on the i-th link during W . Similarly, LQI(i) is the estimation of the packet arrival rate seen by the neighbor node which uses the i-th link. When the link has a low packet error rate, the ETX metric is higher. The LQ extension greatly enhances the packet delivery ratio with respect to the hysteresis-based technique.

III. ADDRESS RESOLUTION PROTOCOL

ADDRESS RESOLUTION PROTOCOL or ARP is used to establish connection between nodes or hosts of the same network and hence means a communication between them. After every hosts gets it's IP address assigned by DHCP or Dynamic Host Configuration Protocol, its being connected by switch to other nodes. The switch being a layer 2 device has MAC address table which has a room for MAC address along with port number, initially empty. Each node has a ARP cache which maintains IP address with corresponding MAC Address of the hosts, its being connected to sometime. Initially it is also empty. For intra-network message passing , the Source has its own Source MAC generated from NIC and its own IP address known. The destination IP address is known for communication but MAC is unknown hence a broadcast MAC address is being assigned as destination address i.e ff::ff::ff::ff::ff::ff and the packet is forwarded to the switch. The switch on receiving broadcast MAC broadcast the message to all other nodes in the network and simultaneously updating its MAC address table with Port Number of Source in switch and corresponding address.

Every other node receives the address and matches it with its own IP address. In case of mismatch the packet is dropped but if the IP matches then the destination send a reply with its MAC address and IP address. The switch on receiving the reply updates its MAC table with port number and hosts information about its address. The reply is hence forwarded to the source matching the port number from earlier updated table. After receiving the reply , the original hosts updates its ARP cache for further reference and communication, now a smoother communication can be done as every other thing is known.

On connection reset the ARP cache is reset along with the MAC address table information is lost and again we need to perform ARP for connection establishment. If the switch encounters a destination IP other than its network address or network address of the network, then it is redirected to the nearest gateway for internetwork communication.

IV. DYNAMIC HOST CONFIGURATION PROTOCOL

With the increasing number of internet users, there is a need of efficiently assigning IP address to each node in a network. Manually assigning will cause time delay and wastage of IP addresses. Hence a solution is DHCP which has four fundamental steps in doing operation. The acronym DORA can be used to remember the steps well.

D for Discovery is a process where the node or host which try to enter the network has its source IP address as 0.0.0.0 initially and destination IP and MAC as 255.255.255.255 and ff::ff::ff::ff::ff::ff. Source MAC is its own MAC address from NIC.A discovery packet is being broadcasted and reaches the DHCP server. Other intermediate nodes discards it. The DHCP server has a port of address in it with same network address. It picks up the first unassigned IP address and hence the second step OFFER i.e. the IP address is broadcasted back to the source. The source on receiving the offers IP address accepts it and REQUEST message id being sent back that it would like to keep the IP address. A acknowledgement packet is the send by unicast to the host and hence the IP is being assigned. Now the IP address is used for both internetwork communication and intranetworking.

Once the node is reset or disconnected the IP address assigned is free and the DHCP server pool has a IP address now available and allocated the freed IP to some othe node who has demanded it.

In real scenario, often there are more than one DHCP servers hence the second step OFFER is a broadcast message that is the node can receive many offers from DHCPs but will choose one and discard others, hence for 3rd step , Request there is communicating with the DHCP server chosen and the rest which are not chosen.

V. APPLICATION

For MANETS the performance of a protocol is coupled with a wide variety of issues mainly physical layer technology, link layer capacity etc and this is because of its' inherent wireless nature. The overall strengths of a routing protocol specifies which domain it could be used in. OLSR a proactive or table driven protocol is used in areas where this access to stored information favors the scenario and new route requests are quite frequent. The protocol also goes in where long delay in packet transmission is not allowable. OLSR is adopted in scenarios where the nodes are dense and communication can be expected to occur between a large numbers of nodes quite frequently.

VI. CONCLUSION

OLSR as we have seen is best for situations of dense network topology, a system that guarantees high packet delivery ratio in such situations. Still we have seen it can be improved in various ways as stated in topology control methods, OLSR-L and BATMAN network routing protocols.

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